Benthic TMDL Development for the Roanoke River, Virginia

Submitted to

Virginia Department of Environmental Quality

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Executive Summary

Introduction

As required by Section 303(d) of the Clean Water Act and current EPA regulations, states are required to develop Total Maximum Daily Loads (TMDLs) for waterbodies that exceed water quality standards. The Roanoke River was included on Virginia's 1996 Section 303(d) TMDL Priority List and Report (DEQ, 1996) because of violations of the General Standard (benthic impairment). The headwaters of the Roanoke River originate in southwest Virginia. The Roanoke River flows through southcentral Virginia before crossing the North Carolina state line and discharging into the Albemarle Sound in North Carolina.

Impairment Listing

The Virginia Department of Environmental Quality (DEQ) uses biological monitoring of benthic macroinvertebrates as one method to assess support of the aquatic life use for a waterbody. Bioassessments of the benthic macroinvertebrate community of the Roanoke River were performed by DEQ using modified Rapid Bioassessment Protocols (EPA, 1999). Results of bioassessments indicated a moderately impaired benthic community at three monitoring stations on the river (4AROA202.20, 4AROA206.03, and 4AROA206.95). Therefore, since the river only partially supports the designated aquatic life use, the General Standard is being violated. As a result, the Roanoke River was included on the Section 303(d) list. Although biological assessments indicated the creek is impaired, additional analyses described in this report were required to identify the causal pollutant (stressor) and sources within the watershed.

The impaired benthic segments (ID #'s VAW-L04R-01 and VAW-L04R-02) are located on the mainstem Roanoke River in the upper section of the Roanoke River basin. Segment VAW-L04R-01 is 9.87 miles in length, beginning at the confluence of Mason Creek and the mainstem Roanoke River, and extending downstream to the Western Virginia Water Authority outfall on the Roanoke River. Approximately 1.46 miles of segment VAW-L04R-02 are listed for benthic impairment, beginning at the Western

Virginia Water Authority outfall on the Roanoke River, and ending at the backwaters of the Niagara Dam impoundment.

Watershed Characterization and Environmental Monitoring

The Roanoke River benthic impairment watershed is approximately 335,785 acres. Forested lands (69.9%), agricultural lands (17.5%), and developed lands (11.1%) represent the dominant land use types in the watershed. The Roanoke River benthic impairment watershed spans the Blue Ridge Mountain ecoregion and the Ridge and Valley ecoregion. The majority of soils in the watershed are comprised of the Berks-Weikert-Laidig, Carbo-Chilhowie-Frederick, Frederick-Carbo-Timberville, Hayesville-Parker-Peaks, and Groseclose-Litz-Shottower soils associations. Combined, these five soil associations account for almost 80 percent of the soils in the watershed.

Environmental monitoring data were vital to the identification of the pollutant stressor(s) that is impacting the benthic community of the Roanoke River. Available monitoring data included biological assessments, water quality monitoring data, and Discharge Monitoring Reports (DMR) for permitted facilities in the watershed. Biological monitoring data from 1994 to 2004 were analyzed. Instream water quality conditions were assessed primarily based on data collected at DEQ ambient monitoring stations, field data collected during biological monitoring surveys, and additional special monitoring studies. In addition, monitoring data contained in discharge monitoring reports were used to assess the impacts of the wastewater treatment facilities in the watershed.

Stressor Identification

Assessment of the primary stressor contributing to biological impairment in the Roanoke River was based on evaluations of candidate stressors that can potentially impact the river. The 2004 Water Quality Assessment 305(b)/303(d) Integrated Report Fact Sheet identified “urban nonpoint source runoff” and “sedimentation” as possible sources of impairment. Therefore, these pollutants were considered in the evaluation of candidate stressors along with other potential stressors such as nutrients, pH, temperature, ammonia, and toxic compounds. Each candidate stressor was evaluated on the basis of